MARKET SURVEY DESCRIPTION

ADVANCED POWER AND THERMAL MANAGEMENT TECHNOLOGIES

DESCRIPTION OF INTENT:

THIS IS A MARKET SURVEY REQUESTING INFORMATION IN SUPPORT OF THE FOLLOWING POTENTIAL REQUIREMENT. No contract will be awarded from this announcement. This is not a Request for Proposal (RFP) or an announcement of a forthcoming solicitation, nor is it a request seeking contractors to be placed on a solicitation mailing list. Response to this survey is voluntary and no reimbursement will be made for any costs associated with providing information in response to this market survey and any follow-on information requests. Data submitted in response to this market survey will not be returned. No solicitation document exists at this time, and calls requesting a solicitation will not be answered.

TOPIC:

TARDEC is conducting a market survey to identify potential sources with the expertise necessary to research, develop, and integrate advanced power management and thermal management technologies into current and future military vehicles. These technologies (further elaborated below) are sought for integration into heavy combat vehicles (including the Abrams, Bradley, and Stryker vehicles) and all classes of tactical vehicles (including High Mobility Multi-purpose Wheeled Vehicle (HMMWV), Mine Resistant Ambush Protected (MRAP) and Joint Light Tactical Vehicle (JLTV)). Emphasis should be placed on common solutions that can be implemented across multiple fleets of vehicles.

Solutions for these issues must be applicable and adaptable to the military environment. This environment includes extreme ambient operating conditions from -20^{o} to 140^{o} Fahrenheit, as well as extreme shock and vibration. Both our soldiers and sensitive on-board electronic loads and sources must be capable of operating effectively within this environment. TARDEC is currently preparing to heavily invest approved Army Technology Objective (ATO) Research and Development (R&D) resources over the next three years into maturing advanced power and thermal management technologies.

Power Management Strategy:
Current Army ground vehicles are approaching or have already exceeded their available on-board electrical power. In addition to this, there is no standard automated on-vehicle ability to monitor and balance power generation, storage, and consumption to meet mission requirements. The current overarching power management strategy is to develop a standard automated independent control system of individual electrical power sources and loads utilizing AI (Artificial Intelligence) to optimize control strategies.

Thermal Management Strategy:
As the Army moves into the future, new technologies/capabilities are being developed and integrated into ground vehicles at breakneck speeds. Unfortunately, currently equipped thermal management systems provide insufficient heat rejection, and therefore severely limit the available output from these new technologies/capabilities. It can easily be postulated that any increases in electrical power demands will significantly impact vehicles' cooling system sizes. The current overarching thermal management strategy is to turn full authority control of all the thermal management systems (including propulsion, electrical components, and HVAC) over to a standardized power management system. In order to do this there must be an electrification of currently mechanically powered sub-systems, more intense monitoring capabilities of sub-

system pressures and temperatures, an integration of electronically controlled liquid cooling of LRU's (Line Replaceable Units) and/or LRM's (Line Replaceable Modules).

Responders to this survey should clearly and briefly address any one or all of the points below, as well as addressing the ADDITIONAL INFORMATION requested below.

QUESTIONS:

Please define what your company's vision of a vehicle Power Management System (PMS) and/or Thermal Management System (TMS) encompasses. Due to variations among packaging constraints, please also specify whether your response is with respect to wheeled or tracked vehicles.

Due to the broad range of vehicle weights, volumes, and complexities within the military fleet, **please address the following strategies in terms of normalized weight metrics.** The reason for this request is so that we can compare many different strategies against each other (independent of any specific vehicle), then intelligently decide on a strategic research direction based on criteria such as innovation/creativity, break-through potential, and realism/achievability.

- *Power Management*

  Please share your company's strategy of how you would reduce the software burden of a given vehicle. Software burden is defined as memory, CPU loading, and hard drive storage of a given application, please identify all the parts of your vehicle computing architecture and divide the sum of the computing resources of all these parts by the total computing resources of a vehicle that it is sized for. Do not include the expected GFE software in these calculations.

  Please share your company's strategy of how you would reduce the weight of a given vehicle power management. Further specified, please identify all the parts of your vehicle power management and divide the sum of the weights of all these parts by the total weight of a vehicle that it is sized for.

  Please share your company's strategy of how you would reduce the volume of a given vehicle power management. Further specified, please identify all the parts of your vehicle power management and divide the sum of the volumes of all these parts by the total volume of a vehicle that it is sized for.

  Please share your company's strategy of how you would increase commonality of the system. Further specified, please identify all power management capabilities of your vehicle power management system (such as vehicle level control software, smart switches, power converters. Explain common software and hardware part of your vehicle power management system.

- *Thermal Management*

  Please share your company's strategy of how you would reduce the weight of a given vehicle TMS. Further specified, please identify all the parts of your vehicle TMS and divide

the sum of the weights of all these parts by the total weight of a vehicle that it is sized for. Do not include the engine or transmission in these calculations.

Please share your company's strategy of how you would reduce the volume of a given vehicle TMS. Further specified, please identify all the parts of your vehicle TMS and divide the sum of the volumes of all these parts by the total volume of a vehicle that it is sized for. Do not include the engine or transmission in these calculations.

Please share your company's strategy of how you would reduce the cost of energy required to remove the system thermal load. Further specified, please identify all targeted hotel loads that your vehicle TMS will require (such as fan power and pumping power) and divide the sum of these hotel loads by the tractive effort of your vehicle at the ground. Do not include the engine or transmission in these calculations.

Please share your company's strategy of how you would increase thermal efficiency of the system. Further specified, please identify all heat rejecting capabilities of your vehicle TMS (such as heat rejected from a high temperature loop and from a low temperature loop) and divide the sum of these rejected heat loads by the tractive effort of your vehicle at the ground.

Also please include how an adjustment to one (or more) of these metrics may positively or negatively affect any and/or all of the other remaining metrics.

Please include any information about particular company proprietary product(s), and/or ideas for significant R&D investments, and/or shifts in advanced philosophical or strategic direction(s), and/or whatever else your company believes it could use to achieve such break-through improvements, if they haven't already been illustrated in the previous sections.

ADDITIONAL INFORMATION:

1. Each response is requested to include:
    a) a brief (no more than one page) company description, history, and industry experience.
    b) an executive summary (no more than one page) of the information submitted in reply to this market survey.
    c) Point(s)-of-Contact (POC) with associated information.
    d) a brief narrative of any internal or external programs that may be leveraged to assist in the R&D of the described technology
    e) a brief outline of any transition plans to military applications as well as the approximate funding required to complete any proposed development efforts.
2. Each response is requested to document any prior related government work experience.
3. Each response should be no more than 25 pages in total.

RESPONSES DUE:

Responses to this Market Survey are due by November 30, 2009. Please submit all responses and any questions prior to full response to Mr. Orest Tarnavsky via email at orest.tarnavsky@us.army.mil. Please format the subject line of the response email as follows;

MARKET SURVEY DESCRIPTION

ADVANCED POWER AND THERMAL MANAGEMENT TECHNOLOGIES

"[Organization Name] response to Market Survey – Advanced Power and Thermal Management Technologies."

RESPONSE FORMAT(S):

Only electronic responses are requested. Please provide responses in any of the following formats: Microsoft word, Microsoft Excel and Microsoft Power Point. The maximum size of each e-mail should be not more than three and one-half (3.5) megabytes. You may use multiple e-mail messages. The subject line must include message 1 of 3, 2 of 3, 3 of 3 etc., as well as [Organization Name]. All interested entities *e.g. companies, non-profit organizations, and academic institutes, regardless of size, are encouraged to respond to this request for information.

GENERAL INFORMATION:

The Government appreciates the time and effort taken to respond to this survey. The Government acknowledges its obligations under 18 U.S.C. §1905 to protect information qualifying as "CONFIDENTIAL" under this statute. Pursuant to this statute, the Government is willing to accept any ***trade secret*** or ***confidential*** restrictions placed on qualifying data forwarded in response to the survey questions and to protect it from unauthorized disclosure subject to the following:

1. Clearly and conspicuously mark qualifying data as trade secret or confidential with the restrictive legend (all caps) "CONFIDENTIAL" with any explanatory text, so that the Government is clearly notified of what data needs to be appropriately protected.

2. In marking such data, please take care to mark only those portions of the data or materials that are truly trade secret or confidential (over breadth in marking inappropriate data as "CONFIDENTIAL" may diminish or eliminate the usefulness of your response - see item 6 below). Use circling, underscoring, highlighting or any other appropriate means to indicate those portions of a single page which are to be protected.

3. The Government is not obligated to protect unmarked data. Additionally, marked data that is already in the public domain or in the possession of the Government or third parties, or is afterward placed into the public domain by the owner or another party through no fault of the Government will not be protected once in the public domain. Data already in the possession of the Government will be protected in accordance with the Government's rights in the data.

4. Confidential data transmitted electronically, whether by physical media or not, whether by the respondent or by the government, shall contain any restrictive legend, with any explanatory text, on both the cover of the transmittal e-mail and at the beginning of the file itself. Where appropriate for portions only of an electronic file, use the restrictive legends 'CONFIDENTIAL DATA BEGINS:" and "CONFIDENTIAL PORTION ENDS."

5. In any reproductions of technical data or any portions thereof subject to asserted restrictions, the government shall also reproduce the asserted restriction legend and any explanatory text.

6. The Government sometimes uses support contractors in evaluating responses. Consequently, responses that contain confidential information may receive only limited or no consideration since the Respondent's marking of data as "Confidential" will preclude disclosure of same outside the Government and therefore will preclude disclosure to these support contractors assisting the evaluation effort.